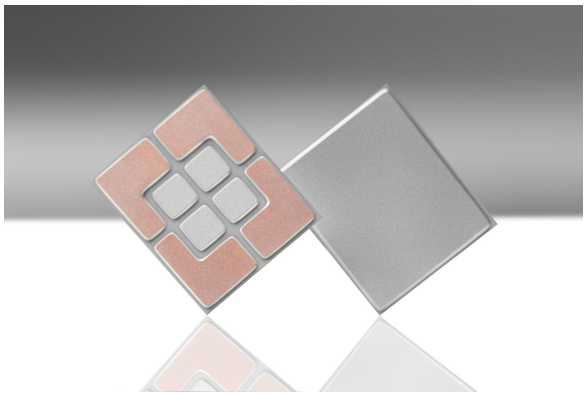
Winspower® CERAMIC SUBSTRATES

AMB technology

Design Rules



Key features
◆ Great heat conductivity and temperature resistance
◆ High insulation voltage
◆ High heat spreading
◆ Adjusted coefficient of thermal expansion between chip and substrate
◆ High reliability

1. Material properties

1.1 Ceramic properties

Material		Si_3N_4	AlN
Bending strength	MPa	> 700	＞350
Thermal conductivity (@ 20°C)	W/m·K	≥ 80	>170
Coefficient of thermal expansion (20°C - 400°C)	10^{-6}/K	2.6	4.6
Dielectric constant（@1MHz）		9.0	8.7
Dielectric loss（@1MHz）	10^{-3}	0.2	0.2
Breakdown voltage	kV/mm	＞15	＞15
E-moduls	GPa	310	320
Density	g/cm^3	3.22	3.3

1.2 Copper properties

Purity	%	99.99
O_2 content		OFHC
Electrical conductivity	MS/m	58 (20 ºC)

1.3 Ceramic thicknesses

	Si_3N_4	AlN
0.25 mm	☑	
0.32 mm	☑	
0.38 mm		☑
0.63 mm		☑
1.0 mm		☑

* other thicknesses on request

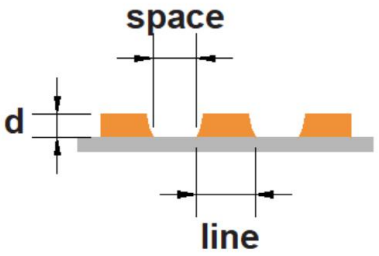
1.4 Copper thicknesses

0.127mm	0.2 mm	0.25 mm	0.3 mm	0.4 mm	0.5 mm	0.8 mm

2. Geometric properties

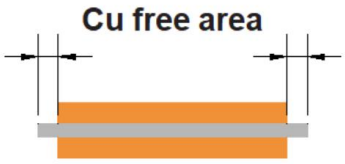
2.1 Pattern min. Width/spacing dimension

Thickness Cu d [mm]	Min. Space [mm]	Min. Line [mm]
0.127	0.20	0.20
0.20	0.35	0.35
0.25	0.40	0.4
0.30	0.50	0.5
0.40	0.60	0.60
0.50	0.80	0.80
0.80	1.0	1.0



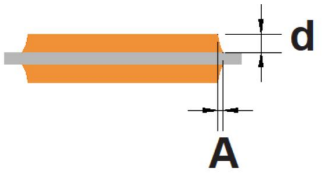
2.2 Ceramic edge perimeter

Thickness Cu d [mm]	Min. Cu free area [mm]
0.10 - 0.25	0.20
0.30 - 0.60	0.30
0.80	0.50



2.3 Etching factor

Thickness Cu d[mm]	Etching factor
0.10 - 1.00	F=d/A＞2

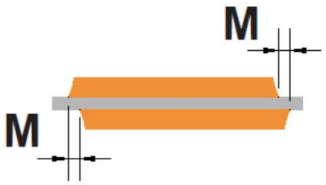


2.4 Etching tolerance

Thickness Cu d [mm]	Tolerance length & width T [mm]
0.10 - 0.15	± 0.10
0.20 - 0.40	± 0.15
0.50 - 0.80	± 0.20

2.5 Misalignment copper pattern front/back

M＜0.2mm



2.6 Dimensions & tolerances

Single parts dimensions	Single parts dimensional tolerances
10mm*10mm—127mm*178mm	± 0.15mm (thickness <0.635mm) ± 0.20mm (thickness ≥0.635mm)

＊ Others on request

2.7 Tolerance of total thickness (ceramic + copper)

Total thickness	+7%/-10%

3. Surface properties

3.1 Surface roughness

R_{max}=50μm ; R_a≤1.5μm ; R_z≤10μm

*Lower roughness on request

3.2 surface finish

Bare copper	-
Anti-oxidation	-
Electroless Ni	3-7μm (6-10% P content)
Electroless NiAu	Au:0.01-0.1μm ； Ni:3-7um
Electroless Ag	Ag:0.1-0.6um

3.3 Solder stop

Pattern width	Min. 0.3mm +/-0.2mm
Mismatch solder stop line (center) to layout (center)	+/-0.2mm
Min. spacing between solder stop pattern	≥0.3mm
Min. Distance from solder stop edge to copper edge	≥0 mm [copper thickness≤0.3mm] ≥1mm [copper thickness >0.4mm]
Temperature resistance	≤320℃ /10s （IPC-TM-650,2.6.8）

4. Product properties

Peeling strength	＞10N/mm（50 mm/min）
Solderability	＞95%
Application temperature	-55℃ ~+650℃ depending on time and atmosphere
Wire bonding	Shearing strength≥1000gf Aluminium Residue after shearing≥50% Condition:Al wire 300um ; Shear speed 500um/s ; Shear height≤30um
Thermal shock	>60cycles @AIN thickness 0.635mm;Copper thickness≤0.3mm >3000cycles @Si_3N_4 All available combinations Condition:-55℃~+150℃,hot/cold chamber system,15min at min/max. Transfer time <10s

Warpage behavior depends on specific layout, single part size and material combination and can only be specified after initial sample preparation